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CONSTRUCTION, RENOVATION AND MANAGEMENT OF ATHLETIC FIELDS

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CONSTRUCTION, RENOVATION AND MANAGEMENT OF ATHLETIC FIELDS

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Too frequently those responsible for selecting and maintaining the field also give it less attention than it deserves. Yet proper preparation and care of a playing field can:

1. Cut player injuries to a minimum, when a springy, evenly-turfed field is provided instead of an uneven brick-hard surface.

2. Be instrumental in making a season successful, as is true when the early-season condition of a proper field is maintained until the season is completed.

3. Be a year-around attraction to campus and town--not a dust bowl at some seasons and a pond at others.

When constructing a new football field or other athletic field, a number of factors such as drainage, physical soil properties, adequate fertility and proper choice of grass should be considered. All of these factors greatly influence the ultimate quality of the playing turf. Proper consideration and attention to these factors during construction, coupled with a sound management program after establishment of the grass, provides assurance of top quality playing turf.

Reduction in player injury alone more than justifies any additional cost that might be involved in doing the job correctly from the beginning. Actually, experience has indicated that sound planning of construction pays dividends for many years. Costly annual renovation will be avoided and reduced maintenance costs will result from a properly constructed field.

Drainage Is Important

Drainage is one of the first factors to be considered in the construction of a new turf area. The poor condition of many turf areas, particularly football fields, may be traced directly to improper drainage. Turf that is weak, thin and unthrifty, invaded by weeds, infested by disease, shallow-rooted and easily torn by cleats, and that fails to respond to fertilization, reveals the characteristics associated with poor drainage and soil compaction (often an indirect function of poor drainage).

For convenience of discussion, drainage may be divided into sub-surface (sub-drainage) and surface drainage.

Sub-drainage

Sub-drainage is essential to facilitate rapid removal of excess water during periods of heavy rainfall and to insure against water-logging of the field. Sub-drainage is most easily accomplished by proper contouring of the

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sub-grade and placing a thin layer (3 to 4 inches) of mixed gravel or cinders over the surface of the sub-grade and some 18 to 24 inches below the surface of the future seedbed. This layer of gravel intercepts the excess moisture moving through the seedbed and facilitates movement and removal from the playing area.

It is recognized that capillary movement of sub-soil moisture toward the surface would be broken by this layer. It is also recognized that roots will not grow through such a layer if it becomes dry. However, it is felt--and experience has indicated--that capillary adjustment is of little importance under turf when irrigation facilities are available. Also, the advantages associated with improved drainage far outweigh any disadvantages that might be incurred by the presence of this layer of mixed gravel.

Surface-drainage

Poor surface drainage is evidenced by standing water in depressions. It may be due to one or both of two distinct conditions. It may be caused by compaction in heavy soils or by the use of heavy equipment. On football fields, player traffic causes compaction.

Crowning of the field, maintenance of a smooth, even grade and periodic filling of any depressions that might occur insure good surface drainage.

Where no excavation of the playing field is planned, the existing soil will most likely not be disturbed; hence, installation of gravel may not be practical. In such cases surface drainage will have to take care of the removal of excess water. If excavation is necessary, the topsoil (if sandy loam) should be removed prior to excavation, stockpiled, and later returned as part of the seedbed.

Soil Preparation

The texture of the topsoil will govern the kind and amount of conditioners needed. The seedbed should contain about 10 to 15 per cent organic matter, some coarse sand (10 to 20 per cent) and the remainder a good sandy loam (preferably a medium sandy loam). There should not be more than 10 to 15 per cent clay present in the seedbed; however, there should be at least 10 per cent.

If the area is not excavated, the coarse sand and organic matter should be mixed and thoroughly worked in as deeply as possible with the existing topsoil. No layering should be evident when mixing is completed. For a football field, probably 30 to 50 cubic yards of sharp river sand (sometimes called builders' sand, No. 6 sharp sand, concrete sand, etc.) would be needed. Some 60 to 100 cubic yards of organic matter would also be needed. The organic matter may be cultivated or agricultural peat--not peat moss--well decomposed, sawdust or gin trash (well decomposed).

These materials should be plowed and harrowed in. A roto-tiller is not recommended, unless extreme caution is exercised. If used too much, a roto-tiller will bring the fine material to the surface. If used, it should be followed by additional plowing (disk plow) and harrowing.

Essentially the same procedure would be followed if the field were excavated.

Barnyard manure may be used as a substitute for the organic matter; however, it is not recommended because it may quite possibly have a high weed content and also, it breaks down (decomposes) too rapidly. If a large supply is readily available in the vicinity and the above precautions are noted, use liberally.

Insure Fertility

The most satisfactory method of indicating fertility needs is to have the soil analyzed. All soils in Arizona should be analyzed for pH and total soluble salts before any fertilizers or amendments are added. The county agent will sample the area and send it to the University of Arizona Soil Testing Laboratory.

(1.) Phosphorus - If tests show the need, incorporate 100 to 150 pounds of P_2O_5 equivalent per acre. Generally speaking, enough phosphorus is present in Arizona soils for turf nutritional purposes.

(2.) Potassium - There is sufficient potash native in Arizona soils to eliminate the need for additional applications.

(3.) Nitrogen - Sufficient nitrogen should be added to aid microbiological activity and offset a tie-up of nitrogen by soil organisms--approximately 40 to 50 pounds of actual nitrogen per acre may be used.

The above materials should be applied prior to final grading of the field. They serve as a reserve source of plant food. The necessity for deep mixing of these materials is obvious because the mineral plant food elements move very slowly in the soil. By placing the material deeply prior to establishing grass, the plants are provided with a readily available supply of food. This promotes deep root development.

Starter Fertilizer

In addition to the above mentioned reserve fertilizer, a nitrogen "starter fertilizer" should be used. One-half the nitrogen should be in an organic form and one-half in an inorganic form. This fertilizer should be applied about 7 to 10 days before seeding and at a rate to supply approximately 40 to 50 pounds of actual nitrogen per acre. It should be raked into the upper two to three inches of the surface and should be moistened once or twice before seeding.

Grass Varieties to Use

Varieties

Where adapted, Bermuda should be the only grass used. It may be sprigged or seeded or both methods may be used. A good high quality seed applied at a rate of two to three pounds per 1,000 square feet (80 to 100 pounds per acre) will give the most rapid cover and will develop the best sod by fall. If climatic conditions indicate, "damping off" (a seedling disease) might occur; the seed should be treated the Arasan or some similar seed treating material.

If sprigging or sodding is preferred, local sod may be used. In the event sprigging is preferred, it would be strongly recommended that the field be overseeded as early as possible.

At the higher elevations of the state, where Bermuda is not adopted, Kentucky Bluegrass is the preferred turf. This is usually planted as a mixture containing 60-70% Kentucky Bluegrass with the balance distributed between Chewings and Creeping Red Fescue and a temporary grass for quick cover, or a nurse crop of either Annual Rye or Redtop. This mixture should be seeded at the rate of approximately 150 pounds per acre.

Seeding

The seedbed should be harrowed lightly prior to seeding. Seeding may be done by broadcasting or by using various types of mechanical seeders, such as the Cyclone Seeder, which essentially broadcasts the seed on the surface. Again, harrowing is necessary with a spike tooth harrow set very shallow or a brush drag. Drills may be used if the soil is reasonably fine and seed is not buried too deeply.

Mulching

All seeded areas should be mulched to conserve moisture for good germination and to control erosion. Where available, a mulch of pulverized, well rotted manure at the rate of one cubic yard to one thousand square feet, spread evenly over the surface, is advised. Straw or weed-free hay at the rate of one to two tons per acre can be used. This mulch need not be removed from the seedling grass if used in moderate quantity and evenly distributed. It decays rapidly and should not interfere with turf development.

Irrigation

Immediately after mulching, irrigate in the seeded areas. Once the surface has been moistened, never allow the mulch to dry out completely until the seedlings emerge. The germinating seeds require a continual supply of moisture until the seedlings form roots and are able to sustain themselves.

CARE OF MATURE TURF

The condition of turf always reflects past management practices. Good or bad management shows up to a greater extent in the spring of the year than at any other time.

Good turf should be tough, wear-resistant and not easily torn by cleats. It should be soft enough to prevent abrasions when players fall, yet firm enough to permit good footing. Good turf should be clipped short enough to prevent hanging of cleats, yet tall enough to insure healthy plant growth and rapid recovery when torn by shoe cleats.

Poor turf is readily recognized under most circumstances. Annual weeds, undesirable grasses and clover often make up the major part of the vegetation. The soil usually is compacted and poorly aerated. Compacted and poorly aerated soil bears shallow-rooted tender grasses that are easily torn by cleats in fall practice and play. Injury to players, particularly around the ankle and knee, are more likely to happen on this type of turf. Also, the grass plants cannot develop deep root systems since there is insufficient air (oxygen) within the root zone and frequent applications of water will have to be used to keep the plants alive. Such watering will further concentrate the roots near the surface. Most of the water then applied will run off the surface and not move into and through the soil properly.

Weeds Indicate Poor Management

Quite often, weedy turf indicates over-watering and improper fertilization, in addition to reflecting soil compaction. Improper fertilization may mean too little total fertilizer, as well as an improper balance of the major fertilizer elements--nitrogen, phosphorus and potassium. No element should be applied in excess of the needs of the plant. This is particularly true of the soluble or inorganic types of nitrogen such as ammonium nitrate, ammonium sulfate, etc. Soluble forms of nitrogen give the plant a quick start, but when supplied in excess it produces tender, succulent growth that increases the chances for player injury and increases the susceptibility of the turf to attacks of insects and diseases.

Grasses are heavy feeders on nitrogen. On a seasonal basis, probably four to five times as much nitrogen is needed as phosphorus and potassium. This nitrogen should, however, be applied in several applications, rather than all at once.

Good turf must be aerated, fertilized and watered properly. Attention to these three fundamentals will insure the establishment and development of tough wear-resistant turf. Aeration, fertilization and controlled watering are so closely interrelated that it is difficult to separate their individual effects. These are the "essentials" in the production of good turf.

Maintenance Recommendations

The following recommendations are given for the establishment and maintenance of good turf. Some phases of this suggested program will not be necessary on certain fields; however, aerating, fertilizing, and controlled watering are strongly recommended on all fields.

Aeration: Aerate the field with some type of hollow equipment, such as an "Aerifier" at least twice lengthwise and once crosswise. Add sufficient weight to insure penetration to a depth of four to five inches. It may be necessary to sprinkle in order to bring the soil to the proper moisture level for maximum penetration. Soil should be moist, but not soggy.

Aeration alleviates soil compaction and permits a free interchange of gases, particularly oxygen and carbon dioxide, between the soil and the atmosphere. Aeration likewise permits placement of nutrients in the zone of root growth, thus aiding in the development of deep root systems.

Topdressing: On fields where topdressing is required, consideration should be given to the type of materials used. A mixture of equal volumes of a good high grade type of organic matter, coarse river washed sand, and a medium sandy loam topsoil is generally considered an ideal topdressing material.

The best type of organic matter is raw sedge or cultivated peat. The high freight rates on this material (it comes from the Midwest) prohibit its use in most cases. A few local "peat" bogs are located in neighboring states. Other types of organic matter that can be used are well decomposed gin trash, sawdust, leafmold, etc. Manure or sewage sludge can be used; however, they decompose readily. When decomposing, these materials have an offensive odor that may make them objectionable. Neither of these should be used later than eight weeks prior to play on the field.

The organic matter, coarse sand and medium sandy loam should be thoroughly mixed with a grinder or mixer. After thorough mixing, the material should be screened through a quarter inch mesh screen. Such a screen can be built from hardware cloth.

This topdressing mixture should be used to fill and level depressions at the close of the playing season. If used as a topping over the entire field, it will have to be applied in the spring. In this case, the field should be topped after aeration and fertilization. Topping the entire field is recommended for smoothing and covering above ground runners in order to thicken up the turf. Not over one-quarter inch of topping should be applied at any one time.

General considerations: Fields that are aerated in early spring need not be topped to fill in aeration holes. Roots and stems of the grass fill in these holes readily and by mid-summer there is no evidence of pitting.

Sawdust, gin trash, leaves, etc. should be composted unless thoroughly decomposed. The addition of aero-cyanamid to the compost aids in decomposing the material, and if applied in layers and wet down occasionally, destroys most weed seed, etc.

Fertilization Program

Following aeration in the spring of the year, a fertilizer--one that contains nitrogen--should be applied. Approximately half of the nitrogen in this fertilizer should be in an organic form. Organic forms of nitrogen are processed sewage sludge (Milorganite and Houactinite), cottonseed meal, tannery by-products, and urea formaldehyde materials. Ammonium sulfate, ammonium nitrate, and nitrate of soda are inorganic or soluble forms of nitrogen. The advantages of having half the nitrogen in an organic and half in an inorganic form are: (1) The inorganic is readily available and serves to give the plants a "shot in the arm." Response to this type of nitrogen can be noted in forty-eight hours. (2) The organic form, because it is dependent on microbiological activity for the release of nitrogen, is more slowly available. This form of nitrogen will "stay" to be utilized gradually and not leached. (3) The organic form releases nitrogen commensurate to the needs of the plant. (4) Grass is not over-stimulated, is less succulent and tender and less susceptible to disease and insect attack when organic forms are used. (5) If soluble forms are used at the recommended rate of application of the complete fertilizer the turf may be severely burned, whereas the combination of the two types produces little or no burning.

This fertilizer should be applied at a rate of approximately 2 pounds of actual nitrogen per thousand square feet.

Supplemental applications of nitrogen will be necessary at approximately monthly intervals after the application of the fertilizer and until about two weeks prior to the first play on the field in the fall of the year.

This nitrogen should preferably be from an organic carrier of nitrogen. Organic types can be applied at a rate to supply 1-1/2 pounds of nitrogen per thousand square feet; i.e., 25 pounds of Milorganite or cottonseed meal. This type of nitrogen will not have to be applied as frequently as the inorganic types.

If the soluble or inorganic forms of nitrogen are used, extreme caution must be exercised or the turf will be burned. Do not apply over 1 pound of nitrogen per thousand square feet of turf from this type of nitrogen. 3/4 of a pound would be better. 2-1/2 to 3 pounds of ammonium nitrate, 5 pounds of ammonium sulfate, or 6 pounds of nitrate of soda per thousand square feet would supply the required amount of nitrogen for supplemental feedings. The frequency of application will probably have to be reduced to twenty day intervals if inorganic forms of nitrogen are used.

It is always desirable to water thoroughly after fertilizer application. It is essential that soluble forms of nitrogen be washed in to prevent burning. Do not apply any type of fertilizer when the grass is moist or wet.

Control Watering Carefully

Controlled watering is one of the most important considerations in the development of good turf. The prevailing tendency is to overwater rather than underwater. Judicious use of water, coupled with aeration and proper fertilization, develops deep rooted turf that is wear-resistant,

tough, and not easily torn by player cleats. Excessive water, as well as too frequent applications, intensifies soil compaction. Plants growing in water-logged soil cannot function properly because of the reduced amount of oxygen available to the root systems.

On new seedlings, the field should be sprinkled lightly each day until the seed germinates. The amount of water applied should be increased and the frequency of application decreased when the seedlings emerge.

Water should be applied to mature turf only when the plants show need of it; i.e., begin to wilt. At this time, the field should be soaked to a depth of four to six inches. It may be necessary to sprinkle lightly before the soil will take in the required amount of water for soaking to a depth of four to six inches. Soils differ in their ability to absorb moisture. Water should not be applied in excess of that which a given soil can take in and hold. When surface runoff is evident, water should be cut off. If the soil is not soaked to the required depth, wait until the moisture has percolated downward and apply additional water.

Reseeding

Bermuda grass is the base sod for turf in Arizona. At the lower elevations, this is the only grass needed. At the higher elevations, Kentucky bluegrass is the major sod and is also combined with fescues.

Where it is necessary to reseed established fields, the rate of seeding will vary, depending on the amount of cover already present.

Seed should be divided into two equal lots, one seed broadcast at right angles to the other. This method of seeding insures a uniform stand.

Mowing

New seedlings should not be cut until they are approximately two inches in height. Only about one-quarter inch of leaf surface should be removed at any one clipping. Football turf should be maintained at a height of approximately 1-1/2 inches during the summer. About six weeks prior to fall play, this may be reduced to a height of 1-1/4 inches, depending on personal preferences of coach and players. Do not make the reduction in one clipping--reduce the height of cut 1/4 inch at each successive mowing. Increase frequency of cutting if necessary. If Bermuda turf is thin, cut at 3/4" to 1" for the first four to six weeks of the growing season. This will cause it to thicken; then raise to 1-1/2". Generally, turf that has been aerated, fertilized and watered properly will require mowing at least twice weekly.

Summary of Recommendations for One Season

1. Aerate the field twice lengthwise and once crosswise.

2. Apply two pounds of nitrogen per thousand square feet.

3. Break up aerifier plugs, fill, level and grade with topdressing mixture if necessary to fill depressions.

4. Seed if necessary.

5. Cover seed lightly with topdressing mixture.

6. Roll lightly and sprinkle lightly, or vice versa, depending on personal preference.

7. Water as suggested above.

8. Mow as variety and condition indicates.

9. Apply additional nitrogen as per discussion.

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